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INTER-COMPANY CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY
Division of Union Carbide Corporation

To: Mr. A. P. Huber
K-1001

Plant: Oak Ridge Gaseous Diffusion

Date: February 9, 1959

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File ✓

Subject: Test Loop Facilities

KP-1628

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In accordance with your recent request, the attached outline describes the test loop facilities which are coordinated by the Process Engineering Division. All these systems are operated by the Production Division and are costed in the production operation. The Process Engineering Division establishes the testing schedule, the equipment types, the data requirements, and coordinates the distribution and analysis of the results.

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Union Carbide Nuclear Company, Oak Ridge Gaseous
Diffusion Plant, Operating Contractor for the U.S.
Atomic Energy Commission.

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K-309-3 A Test Loop

The K-309-3 A test loop is designed to define the performance characteristics of size 0 and size 00 converters with the associated gas coolers, and K-29 and K-31 compressors. With the special instrumentation, it is possible to establish the performance curves to a precision of approximately 1.5 per cent at heat and power loads commensurate to those experienced in the plant. When this test loop is moved to the K-633 building, provisions will be incorporated in the Freon and process gas systems to facilitate testing at 30 psia and 375°F.

K-309-3 C Test Loop

The K-309-3 C test loop is capable of defining the performance of centrifugal stage compressors, size 1, 2, 3, or 4 converters, and all control valves utilized in the K-25 and K-27 buildings in the present piping configurations. In this facility, the compressor suction and discharge lines duplicate those of production stages; however, the Freon cooling system limits the gas cooler investigations to the size 2X external type. With the special instrumentation, it is possible to establish performance curves to a precision of approximately 1.5 per cent at power loads comparable to those of the plant. This is the only facility available for testing K-25 stage components. When this loop is moved to the K-633 building, a liquid recirculating coolant system will be incorporated to facilitate testing of the other heat exchangers utilized in the K-25 building. The applicability of data reduction techniques will also be studied in this facility.

K-633-1 Test Loop

The K-633-1 test facility is utilized to define the performance characteristics of size 000 converters, K-33 compressors, and the various types of heat exchangers considered for improvement programs. With the instrumentation available, it is possible to establish the performance curves to a precision of approximately 1.0 per cent at heat and power loads commensurate with those of the plant. It is also feasible to determine the influence of various internal configuration designs (transitions, shrouds, turning vanes, etc.) on the overall stage performance. When modifications now in progress are complete, the facility will be capable of testing at 30 psia and 375°F. Modifications to be conducted on the Freon system will permit the definition of the performance characteristics of sizes 0, 00, and 000 separators and size 000 countercurrent flow evaporators in conjunction with heat recovery and power uprating studies.

K-633-2 Test Loop

The K-633-2 system to be constructed this year will augment the present 33 size compressor test facilities. The special instrumentation provided

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for this installation will duplicate the accuracy of the existing K-633-1 loop. Operation at 14 psia and 375°F. can be attained without difficulty.

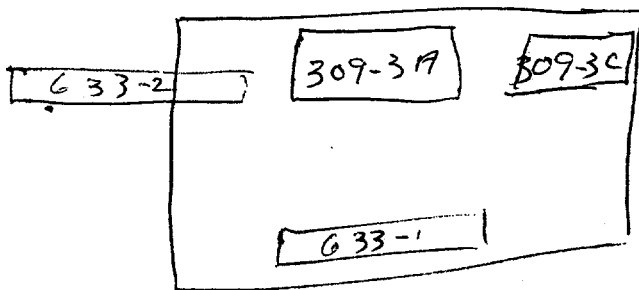
Freon Turbine Test Cells

Special facilities were installed in the K-33 fully-instrumented cell (K-902-4.6) to simulate operation with a Freon turbine and the associated liquid pump required to overcome the turbine resistance in the system. The effects of process variables on a heat recovery system were defined, and the instrumentation necessary for evaluating the performance characteristics of prototype equipment was established. The system is being revised preparatory to the installation of the Allis-Chalmers equipment. A second test cell (K-902-4.8) is planned to permit simultaneous evaluations of the Allis-Chalmers and Thompson turbines. With these facilities, it will be possible to establish the benefits of heat recovery as a function of turbine and pump efficiency and degree of liquid Freon entrainment. The effects of all process variables in terms of the heat recovery potential will also be studied.

Specially Instrumented Cells

Specially instrumented cells are installed in the K-25, K-27, K-29, K-31, and K-33 buildings to study the behavior of the cascade equipment under normal operation conditions. The information obtained from these measurements facilitate the determination of such factors as heat loss to ambient, the influence of cascade transients, etc., which cannot be established through test loop investigations.

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